AUSTRALIAN SOCIETY FOR LIMNOLOGY

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LIMNOLOGY NEWSLETTER

Volume 25. Number 2. April 1987

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LIMNOLOGY

NEWSLETTER

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AUSTRALIAN LIMNOLOGY TO 1986

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INTRODUCTION

When first approached by your President to talk on the subject of "Australian Limnology to 1986" I was both pleased and discomfitted: pleased because I felt honoured to be invited as a key speaker at this particular Congress; discomfitted because I was asked to speak about the past, whilst the other keynote speaker was asked to address the future. I vaguely suspect that Ian Campbell was, as always, putting me in his perception of where my place is! As you will see, pleasure got the better of discomfiture, and here I am. But, Mr President, before I go on, let me state quite unequivocally: no matter what you think of me or intended, my testes are in remarkably good shape, my mind is trained and powerful still, and I am looking forward to attending the golden jubilee of the Society.

The study of Australian inland waters can conveniently be divided into three periods: one before about 1900; one between about 1900 and 1950; and, finally, a period covering the past 35 years. These can be regarded perhaps as periods of early exploration, or unco-ordinated description, and a period during which a gradual awareness arose that investigators of inland waters in Australia had a common bond, and during the latter part of which limnology greatly expanded. If you like, they were the "Gee Whiz" period, the "Doldrums", and the "I think I'm a limnologist" period!

I propose briefly to consider the most important limnological contributions of each period. But a bald historical resume of that sort alone would provide a monochromatic view of Australian limnology to 1986. In addition, therefore, I shall discuss some broader issues which have been important in shaping Australian limnology.

PERIOD OF EARLY EXPLORATION

Early limnological knowledge was essentially anecdotal and not always near the truth. Whilst aboriginal Australians were extremely knowledgeable about pragmatic matters - such as where fish and potable water occurred - their division between the real and spiritual aquatic world could not always withstand objective scrutiny. Bunyips may have existed before the advent of white settlers, but the only hard evidence of them ever produced by aborigines, a skull found in 1846 on the banks of the Macquarie River, is probably the skull of a deformed ox or calf. It is now in the Macleay Museum (Williams, 1983). There was also a discrepancy between the real and imagined environment of many early European settlers. It was not until well into the nineteenth century that settler illusions about the presence of vast bodies of fresh water in central Australia were finally laid to rest.

As for more serious limnological knowledge, the most important contributions of the nineteenth century related to the discovery of some singularly Australian and unique aquatic animals, and the recognition of the ephemeral and often salty nature of many Australian inland waters.

The platypus was apparently first seen by the colonists in 1797. The first published account of its occurrence was in 1802 (Collins, 1802), but a specimen was described by a George Shaw in 1799 (Shaw, 1799). At first thought a fake, its unique anatomy was soon authenticated by Sir Everard Home in 1802 (Home, 1802). However, its egg-laying habits were not authenticated until as late as 1884 when W.H. Caldwell visited Australia from Oxford (Caldwell, 1887). His telegram to the British Association for the Advancement of Science, then meeting in Montreal - Monotremes oviparous, ovum meroblastic - was memorable, not least perhaps to the station owner and passing mailman who forwarded it. Whilst credit for authenticating the egg-laying habit perhaps rightly belongs to Caldwell, it may be noted that, according to Mulvaney and Calaby (1985), at the time of Caldwell's visit many Australians knew that the platypus laid eggs. One, a Mr F.H. Williams, appears to have said as much in a paper read to the Field Naturalist's Club of Victoria in 1880 (Williams, 1884). Caldwell, incidentally, abandoned science on return to England.

The first full description and recognition of the scientific importance of the Queensland lungfish was in 1870 by Gerard Krefft, a German immigrant and Director of the Australian Museum between 1860 and 1874. Studies of the lungfish were also carried out by Caldwell, though never fully published (Caldwell, 1885), and a little later, and to more effect, by Baldwin Spencer who settled here in 1887 (see Spencer, 1893).

The Tasmanian mountain shrimp was discovered by G.M. Thomson, a visiting scientist from New Zealand in 1892 (Thomson, 1893, 1894). It was first allied with the mysid shrimps, but its true affinities were quickly recognised by W.T. Calman, the famous British carcinologist, who pointed to its affinities with certain fossil Palaeozoic Syncarida (Calman, 1896).

There is no time to discuss all the many less "heroic" nineteenth century additions to our knowledge of Australian aquatic animals, but at least passing mention should be accorded Baldwin Spencer's notes on the crustaceans of ephemeral waters in central Australia, and his ideas on faunal biogeographic subregions - both corollaries from his association with the Horn Expedition to central Australia in 1894 (Spencer, 1896). Mention should also be made of the serendipitous but beautifully illustrated descriptions of certain freshwater animals in McCoy's Prodromus of the zoology of Victoria (eg of the Murray lobster, McCoy, 1878), and of Thomas Whitelegge's list of 1899 of the marine and freshwater invertebrates of Port Jackson and neighbourhood (Whitelegge, 1889). Whitelegge's paper listed most of the papers on Australian aquatic invertebrates published before 1889.

Nineteenth century botanical contributions were of lower profile than zoological contributions, but the recognition by Francis in 1878 that large populations of Nodularia spumigena, a blue-green alga, were toxic to cattle, as noted by him in Lake Alexandrina, South Australia, was apparently the first record of this important phenomenon.

As for more general early limnology contributions, it was not until well into the nineteenth century that the truly arid nature of Australia began fully to be appreciated, as I indicated earlier. Lake Eyre was first seen by Europeans in 1840, but even as late as 1860 it was still believed that most of central Australia had an unbroken drainage outlet to the sea via Lake Torrens. The exploration of Lake Eyre was not completed until 1874-1875.

Most early, general observations of value came from expeditions which only incidentally recorded notes of limnological interest. A salient observation of most inland expeditions was, of course, that ephemeral and saline waters, not permanent and fresh waters, predominated over large tracts of the inland. The first analyses of waters from Australian salt lakes would seem to have been made by no less a chemist than Faraday who was sent samples collected by Major Mitchell during expedition (Mitchell, 1838). Faraday reported that "all of them are solutions of common salt much surpassing the ocean or even the Mediterranean in the quantity of salt dissolved". Faraday's remarks have stood the test of time remarkably well; all modern analyses of Australian salt lakes vindicate them. The first analysis of water from Lake Corangamite, the largest body of permanent water on the mainland, and also salt, was made in 1892 by Craig and Wilsmore (1892). And attention was first drawn to the great variation in lake-levels in Australia by Abbay in 1876 (Abbay, 1876).

PERIOD OF UNCO-ORDINATED DESCRIPTION

1900 does not make a sharp division between the exploratory period and the period of unco-ordinated description. Indeed, at the turn of the century, many contributions could comfortably be placed in the earlier period, whilst others, published a decade or so before the century's turn, provide the basis of modern limnological knowledge.

The period began well enough. There was a flurry of activity from geographers, geologists and zoologists, the latter located both in Australia and overseas; but the impetus was soon lost. For most of the period 1900-1950, in fact, Australian limnology slumbered, or perhaps wallowed, with but few publications to indicate that it was alive if not well. I did not lightly designate the period as the "Doldrums". The appalling human drainage of two world wars, the economic depression of the 1930s, and the straightened financial circumstances of Australian universities and museums undoubtedly explain most of this phenomenon; but, whatever the explanation, the parlous state of Australian limnology during the first half of this

century contrasts during the same time with the greater enthusiasm of Europeans and North Americans to understand how their inland waters functioned and what they contained. The occurrence of water and depression, it might be unkindly added, cannot provide the whole explanation, because the British, who had lagged somewhat in their own enthusiasm for limnology, did form the Freshwater Biological Association of the British Empire in 1929 and this moved into permanent albeit modest quarters in 1931 at a time, as Fogg (1979) noted, "of the great slump and a bad time for a new venture". I do not know why the motion proposed by Baldwin Spencer at the 1921 Congress of the Australasian Association for the Advancement of Science and calling for a survey of freshwater animals throughout the continent was not implemented by the Australian National Research Council.

Of those who did contribute during this period, special mention should be accorded G.O. Sars, who, by hatching specimens from dried mud sent him in Norway, in a long series of early papers provided the basis of our knowledge of the Entomostraca of Australian inland waters (eg Sars, 1887, 1904). Notable contributions to our knowledge of the Entomostraca were also made by Marguarite Henry, working from Sydney, and by O.A. Sayce, working from Melbourne. Sayce contributed, as well, to the basis of our knowledge of Australian malacostracan crustaceans in a series of fine papers, and I take this opportunity of recording that although he was an amateur his work was altogether of a higher standard than many professional zoologists of his time. Sayce's descriptions of freshwater amphipods, for example, were incomparably better than those of Geoffrey Watkin Smith, a visitor from New College, Oxford, who was described by Julian Huxley (1970) as his "brilliant zoological tutor". I once wrote to Huxley to find out what became of Smith, who, despite his poor amphipod descriptions, did contribute significantly to our knowledge of Tasmanian fresh waters (eg Smith, 1909), but was informed that Smith had been killed on the Somme in the First World War.

Other important contributors to our knowledge of aquatic crustaceans were S.M. Manton, another visitor from Britain, G.E. Nicholls, Ellen Clark, C. Chilton, W.J. Dakin and D.L. Serventy. R.J. Tillyard (especially 1926) was the outstanding contributor to our knowledge of aquatic insects, W.A. Haswell, E.G. Goddard, C.J. Gabriel and T. Iredale to that of non-arthropod invertebrates (ie hemnocephalids, leeches and molluscs). Even Errol Flynn's father contributed (Flynn, 1922).

Important ichthyologists of this period were J.D. Ogilby, G.F. Whitley and A.R. McCulloch, but, overall, contributions concerning aquatic vertebrates were less substantial than those of the previous century by Castelnau, Cuvier, Valenciennes and Guntner on fish, and by Boulenger on amphibians and reptiles.

West's (1909) study of the algae in Yan Yean Reservoir, Melbourne, and Playfair's studies of the microscopic fauna and flora of waters in the Sydney area (eg 1914), were important botanical papers of the period. Perhaps Mawson's (1929) paper on algal limestone should also be referred to at this point; it was apparently the first ever record of stromatolites, though Mawson himself did not use that term.

Information on physical limnology came from a variety of sources. Several physical geographers wrote on the origins, physiography and morphometry of Australian lakes, especially J.W. Gregory (e.g. 1903, 1916), J.T. Jutson (1934) and E.S. Hills (1940). Geologists became interested in the origin of salt in both fresh and saline lakes (e.g. Jack, 1921), as also did some chemists, especially V.G. Anderson (e.g. 1945). And, of course, the various state water authorities continued to consolidate information on water quantity with particular regard to river discharges. Even by 1911 it was possible to produce a reasonably accurate and comprehensive list of all Australian lakes with information on their basic chemistry (fresh, potable, "brackish", etc.) and morphometry (Official Yearbook of the Commonwealth of Australia, 1911).

THE LIMNOLOGICAL GENESIS

Like 1900, 1950 does not sharply demarcate periods, but since 1950 was the year that the Australian Journal of Marine and Freshwater Research began publication, and the fifties was the first decade during which a recognizable bond uniting Australian water scientists arose, it is convenient to use 1950 as a reference date.

In a sense, then, 1950 marked the beginning of 'limnology' in Australia. Had I wished to be pedantic I could well have restricted myself to a consideration of the past 35 years, since it is doubtful if more than a handful of people in Australia prior to 1950 knew what limnology was, let alone regarded themselves as limnologists. Indeed, there were no individual members of the International Association of Limnology before or even during the 1950's.

In documenting the important contributions to Australian limnology during this period, I am aware of the need for tact and the potential for bias. Brevity is probably a wise policy. For this reason, I identify only the more comprehensive publications of the period without extended comment. I deliberately eschew the more difficult (and potentially more contentious) task of attempting any review of scientific themes or of the contributions of individual limnologists. For ease of consideration, the publications can be divided into six main categories.

First, there are those few which dealt more or less comprehensively with the limnology of Australian waters. Inland Waters and Their Ecology by Bayly and Williams was published in 1973, and reflected a dissatisfaction with the lack of an appropriate text for teaching limnology in Australia. The only modern limnological text in English then available worldwide was Frey and Fry's translation of the third edition of Ruttner's Grundriß der Limnologie (Ruttner, 1963), a book emphasizing European conditions and first published in 1940. It lacked a certain 'empathy' with the real world of Australia. Bayly and Williams's text is now out of date, and in an attempt partly to compensate for this and partly to discuss areas of limnology not covered by them, I wrote Life in Inland Waters, published in 1983 (Williams, 1983). I record that I could not find an Australian publisher for this book; it was eventually published by the Australian subsidiary of a British firm. Finally, the book by Serventy and Raymond (1980), Lakes and Rivers in Australia, should be mentioned. It is an excellent natural history text, and though written for the wider audience, should command our attention more than it seems to.

Second, there are those publications which brought together a number of invited reviews dealing with various features of the inland aquatic environment. The first was edited by Weatherley (1967), Australian Inland Waters and Their Fauna: Eleven Studies. Without expanding on the matter, let me note that it proved reasonably difficult for Weatherley to obtain sufficient contributors of the right blend. That was never a difficulty for its successors. These have been books edited by Williams (1980b), which emphasised ecological management of inland waters, by Haigh (1983), which concerned wetlands, and by De Deckker and Williams (1986), which deals with a wider range of topics than any of its predecessors. It is also much thicker!

A third category, related to the second, involves those publications documenting the proceedings of conferences held either in Australia (mostly) or elsewhere, and which discussed matters of interest to Australian limnologists exclusively or in substantial part. The most important publications like this have concerned water quality sensu lato (Hart, 1982; O'Loughlin and Cullen, 1982; Hart and Allanson, 1984), salinity problems (Holmes and Talsma, 1981), salt lakes (Williams, 1981), palaeolimnology (Chivas, Torgersen and Bowler, 1986), destratification (Burns and Powling, 1981), biogeochemistry (Trudinger, Walter and Ralph, 1980), the River Murray (Warren, 1978; Frith and Sawer, 1974), and southern hemisphere limnology (Davies and Walmsley, 1985).

A fourth category is of books whose authors dealt comprehensively with particular groups of the Australian aquatic biota. Such groups are macrophytes (Aston, 1973; Sainty and Jacobs, 1981), invertebrates as a whole (Williams, 1968, 1980a), insects (CSIRO, 1970, 1974; Neboiss, 1986), fish (Lake, 1971, 1978; McDowall, 1980; Allen, 1982; Cadwallader and Backhouse, 1983; Merrick and Schmida, 1984), amphibians and reptiles (Cogger, 1975, 1979; Tyler, 1976; Barker and Grigg, 1977; Cann, 1978; Cogger, Cameron and Cogger, 1983), and waterfowl (Frith, 1967). An early and elementary introduction to all groups of the biota was provided by Child (1968).

A fifth category involves books whose authors wrote on matters of global rather than regional limnological interest. Such books are significant not only for what they contain but also because they are Australian contributions to the wider limnological community.

Important here are the books by Weatherley (1972) on fish ecology, by Kirk (1983) on light and photosynthesis, by Connell and Miller (1984) on ecotoxicology, that edited by Davies and Walker (1986) on the ecology of large rivers, and by Harris (1986) on phytoplankton ecology.

A final category is of books which attempted to deal comprehensively with the ecology and biogeography of Australia or regions thereof and which, in the course of doing so, included much of limnological import. Mention is made of those edited by Keast, Crocker and Christian (1959), Keast (1981) and Williams (1974).

One further book which should be accorded note but which does not comfortably fit into any of the above categories is the one by Connell (1974, 1981). It dealt with the subject of water pollution in Australia.

I will later refer in detail to the importance of the publication of the Australian Journal of Marine and Freshwater Research for Australian limnology, but in any consideration of publications during the period 1950 to 1986 I would be remiss were I not to make reference to those issued by the Department of Resources and Energy in Canberra. The emphasis of these publications has largely been upon the value of water as an economic resource, but even so they contain much of interest and value to pure as well as applied limnologists. The most important have been the Hydrological Series, Technical Papers (note especially the one by Hart, 1974), Proceedings of Symposia sponsored by the Department, Occasional Papers, and the Review of Australia's Water Resources, 1975. All of these have appeared under the sponsorship of the Australian Water Resources Council. Also important is the Water: 2000 Study, especially the consultants reports (e.g. O'Brien et al., 1983; Brown, 1983), and Water Research in Australia: Current Projects, which forms part of the Streamline data base.

BROADER ISSUES

Having outlined the skeleton upon which Australian limnology hangs, so to speak, let me consider the special blend of issues which have combined to provide the body. There are a great many of these, some more important than others. I can do no more than sketch in those that seem significant to me. There are, of course, clear differences between almost all countries in the way that limnology has developed and is practised, but they are, in my view, especially clear in Australia: Australian limnology in 1986 is a very different hue from contemporary British, North American or European limnology, for example.

Clearly, the most important formative issue has been the nature of the aquatic milieu itself. Australia is arid, salt lakes and temporary waters abound, and permanent freshwater lakes and streams are confined to relatively small areas. I would not go so far as to agree with Sir John Murray who, writing in 1910, said: "No lakes of any importance are connected with the rivers of Australia". But I admit that there is an element of truth in what he said! Moreover, those waters present are distinguished by a number of special chemical, physical, hydrological and (not least) biological features. To begin with, then, the Australian limnologist has had a very distinctive working environment.

An important cause of much of the biological distinction has been the long geographical isolation of Australia. This has also had an impact upon Australian limnologists because, as a result, it has always been expensive and therefore difficult for them to meet with colleagues in other countries. Even our near neighbours, the New Zealanders, are not often visited. There was a time in the nineteen sixties when attempts were made to arrange a joint meeting of the Australian and New Zealand societies for limnology. They failed miserably. Likewise, ties with South Africa, the country with perhaps the greatest similarity with Australia in terms of water resources, are very slim (and for the most part also very recent). I would not wish to attach undue importance to this sort of isolation, but I believe that it has had, and continues to have, a bearing upon the way limnology has developed in Australia. Perhaps the strong regional flavour that characterises much of Australian limnology to 1986 is a particular reflection of it. The zest, iconoclasm and fun, which, to my mind, differentiate many young Australian limnologists from their more sombre colleagues elsewhere, may also reflect this isolation!

The isolation (and distinctive nature of the environment) has also served Australian limnology in another way. It has served to attract a rather large number of visiting limnologists, either as members of expeditions to particular parts of Australia (e.g. the Hamburg expedition to south-west Australia [1951-1952], or singly as students of particular biological groups. Their contribution has been major. We even gave the Jolly prize for outstanding contributions to Australian limnology to one of them (H.B.N. Hynes in 1984). Such visitors will continue to arrive, and, indeed, the forthcoming SIL conference in New Zealand is likely to promote a new influx in the near future.

As an aside, I cannot refrain from adding here that one particularly famous visiting biologist to our shores made no direct contribution. I refer to Charles Darwin. He found us most uncongenial. Here are some of the things he had to say about his own visit (Darwin, 1839):

"The whole community is rancorously divided into parties on almost every subject."

"My opinion is such, that nothing but rather sharp necessity should compel me to emigrate."

"We stayed there [Western Australia] eight days; and we did not during our voyage pass a more dull and uninteresting time."

He was even less kind about New Zealand.

"It is not a pleasant place. And the greater part of the english [there] are the very refuse of society. Neither is the country itself very attractive."

There is, of course, another sort of visitor who has had an important impact on Australian limnology to 1986. Visitors who did not go away. I am one of them. Others include many current or late members of this Society, several of whom have occupied high office: Hilary Jolly, Ian Bayly, Peter Tyler, Jonn Kirk and David Mitchell spring to mind. Imports of this ilk have stretched for well over a century, as indeed one might expect in an immigrant country such as ours. Baldwin Spencer and G.E. Nicholls (incidentally, the father of our first president, Dr A.G. Nicholls) were amongst early immigrants who contributed. I think it fair to say, however, that such early scientists overall had a rather muted impact on Australian limnology. A much greater impact resulted from the later importations, that is from those who came from about 1960 onwards. One of them, indeed, P.A. Tyler, has laid serious claim to Tasmania as his personal 'Lake District', a claim not easily denied; his efforts to describe and understand Tasmanian lakes have been immense. I would add a personal note on this matter, nowever. I hope that the relative contributions of such scientists - and of course I am not speaking at an individual level! - will decline during the next 25 years of the Society's history. In this connection, perhaps I may quote some remarks made recently by Arthur McComb and me to the Australian Water Research Advisory Council in response to a request by them to identify research needs covering the ecology of reservoirs, lakes and wetlands:

"Professional and competent research on water resources in Australia requires the reliable recruitment of competent and highly trained research scientists. It is not accident that many contemporary water research scientists were born outside the continent. But it is surely unwise for the nation to continue to depend on outside sources for its research scientists. Rather, in our view, research on Australian water resources is an activity which should increasingly become an important vocation to young Australians."

Yet another sort of "visitor" has played an important role in shaping Australian limnology: those laboratory-bound and largely European scientists who worked on material sent them by Australian colleagues but who in fact never set foot on Australia. The most influential of these was undoubtedly G.O. Sars, who, I gather, scarcely ventured from his native Norway, let alone contemplated a visit to Australia, that "remote part of the world" (Sars, 1888: 3). I referred to him earlier. Since few Australians speak Norwegian, it is

fortunate that his papers were in English, albeit a sometimes faintly quaint version: "In the year 1902 Mr. A.O. Sayce of Hawthorn ... placed in my hands some alcoholic specimens" (Sars, 1904: 3). And "I have partly published the result of a series of experiments ... to obtain ... domesticated Australian fresh-water Entomostraca" (Sars, 1888: 3).

Let me turn now from considering migrants and "missionaries" and consider some events and general trends that have characterized Australian limnology to 1986, and that have often been important formative features. I can identify at least seven: a notable lack of governmental funding, the descriptive bias, the preoccupation with introduced biota, the failure to capitalize on particular Australian environments and biota, and the uneasy relationship with the conservation movement. Of positive events of this sort, the publication of the Australian Journal of Marine and Freshwater Research, and the foundation of the Australian Society for Limnology have been most important. Perhaps an eighth and relatively recent phenomenon may also be added: the tendency to be concerned less with fundamental aspects of limnology than with applied ones (and there is no doubt that this partly reflects perceptions of where support, such as it is, is available). I shall deal briefly with each of these matters seriatim except for the last.

As for the paucity of governmental support for limnology, I am at a loss to explain this phenomenon. A reasonable person might assume that in a country where water, a basic resource, is in short supply, a good deal would be known about all features of that resource. The converse is the case, however. Australia, almost alone of developed nations, has chosen not to invest to any significant degree in limnological expertise and knowledge.

Thus, until recently, CSIRO (as an organization) has remained singularly disinterested and aloof in matters limnological. There has never been in Australia any equivalent of the Freshwater Biological Association's laboratories or the Water Research Centre as in the UK, of the Freshwater Institute or the Canada Centre for Inland Water as in Canada, of the National Institute for Water Reseaarch as in South Africa, or of the limnological institutes of the Max Planck Gesellschaft as in Western Germany. State government instrumentalities did not consider limnogical research as part of their bailiwick. The important riverside laboratories located on the Magela Creek in the Northern Territory and the River Murray at Albury, and funded, respectively, by the Office of the Supervising Scientist, and until recently, the Albury/Woodonga Development Corporation, have restricted research programmes associated with either the mining ;of uranium or the impact of man on the Murray. And the tertiary educational institutions were essentially non-contributors before 1957 and even after the Mrrray Report have remained nobbled by financial constraints (though this in no sense denies the importance - and valour - of the water research centres at the Chisholm Institute, Canberra College of Advanced Education, and University of Western Australia). The foundation of the

Australian Water Resources Council (AWRC) represented the only significant government initiative until recently, but for most of its relatively short life (1962-) it has been concerned more with assessment than with research. Nevertheless, its provision of small amounts of research support and its publications have, within limits, been important.

As I say, I am at a loss to explain the paucity of governmental support. Conceivably, it is because the most important people in the so-call 'water industry' in Australia, i.e. the; State water authorities, were concerned first more with water quantity than water quality, and it is mostly in matters of quality that limnological expertise comes into its own. One result has been that water authorities became dominated by the profession best suited to advise on matters of quantity, namely the engineering profession. Then, once the hierarchy had established, the pattern set hard, and those in control brooked no change. There are signs that changes and reorganizations are now taking place in certain water authorities, but it does seem that most involved changes for better accountability and economic management than for better resource management. Better resource management, of course, requires money for research of a sort usually unfamiliar to engineers and therefore somewhat suspect.

From time to time, members of parliament and other more sensible bureaucrats (I chose my words carefully!) have expressed concern over the lack of water research activity, and this has sometimes resulted in official enquiries. There has been a flurry of them lately. The general results, as seen from the outside, have been the publication of a report for pigeon-holding, considerable rhetoric from the Minister involved, and a series of recommendation of which only those costing no money are acceptable.

Thus, in 1977, The Senate Standing Committee on National Resources investigated the Commonwealth's role in the assessment, planning, development and management of Australia's water resources. Following the investigation, the Minister of National Development, the Hon.K.E. Newman, issued a statement in the House of Representatives (Mar. 28, 1979) which, amongst other matters, noted that: "continuing scientific and economic research on major current and emerging problems relevant to the Commonwealth's water policy objectives is essential (my emphasis), if timely and effective solutions are to be found and implemented" (Newman, 1979). Amongst the many recommendations proposed were one to "establish a national research program" and one to "upgrade and extend the AWRC secretariat". As far as I can determine, nothing very much came of the recommendations.

A few years down the track, Ralph Jacobi, a member of the federal parliament, put forward a Private Member's Bill which was highly critical of the lack of research into Australia's water resources and sought to correct this in part by suggesting the establishment of a Freshwater Institute to prosecute such research. It was debated in the senate in 1982 but lapsed in the Lower House. Mr. Jacobi, I should add, was of the wrong political persuasion at that time.

At about the same period, the AWRC established a working party to report inter alia on the "adequacy, effectiveness and overall balance of the national effort in water research". It concluded that: "Australia's current water research effort (was) inadequate, fragmented and poorly balanced and (had) gaps. Immediate national needs were sound management, leadership and substantially increased funding" (not my emphasis) (Working Group on Water Research Policy, 1981). By and large its recommendations were never implemented because of a change of government. And the short-lived National Water Research Council which was one of the few recommendations implemented was essentially a meet-and-eat event.

The most recent government enquiry has been to examine the proposal for an Institute of Freshwater Studies. Its report, after some considerable delay, was finally published in 1984 (Interim Council, 1984). Procrastination and obfuscation, or so it would seem, have so far been able to thwart the release of any large amounts of money to implement most of its recommendations. Nevertheless, a few have already been implemented. Amongst them, notably, was one to establish an Australian Water Research Advisory Council. It would be unwise to hold one's breath, but due to some brilliant footwork by enlightened bureaucrats (I cannot of course reveal their names) I am beginning to believe that this report and its recommendations mark the turning point in the tide of governmental attitudes to limnological research in Australia. In nomine patre, et filius, et spiritus sanctus .... In the meantime, I draw to your attention the fact that applications for appointment as water research administrators have been called for. Several positions are available. I also draw your attention to the fact that the present Australian Government, like most of its predecessors, has difficulty in distinguishing between tasks that are urgent but not very important, and those that are not so urgent but very important. Expect priority for the former.

I have a feeling that if I continue in this vein, I shall find myself in deeper water than is wise. Let me head for the shallows, then, and consider the next general feature of Australian limnology to 1986: its descriptive bias. Very little need be said on this score, except to draw attention to it. A number of my overseas colleagues have also drawn attention to it, with, I usually detect, a slightly disparaging air. My own attitude to the bias, however, is that we have no need to feel apologetic: it would be strange indeed had Australian limnologists decided first not to describe carefully the unique aquatic biota and distinctive environments of Australia, but, instead, to have traded with our colleagues elsewhere processes, theories and models predicated on a shaky descriptive base. That said, however, I do think that the recent trend in Australian limnology away from description is both healthy and welcome. [The nature of G.G. Ganf's Jolly Award Address (to be given following this paper) provides a particularly apt example (Gant, 1986.] But now Australian contributions of this sort have a respectable descriptive framework and are thereby the more credible.

Another general feature of Australian limnology to 1986 that can also be dismissed relatively quickly has been the preoccupation with introduced biota. I do not use the word preoccupation in a perjorative sense here, but rather in the neutral sense that more attention has been given to introduced aquatic animals and plants by Australian limnologists than is the case elsewhere. This reflects, of course, the fact that any aquatic plants and animals have been introduced into Australian inland waters, found conditions suitable, spread widely, and are now important elements of the Australian aquatic biota. They include about 19 species of fish (especially carp, brown trout, mosquitofish, cichlids), the cane toad, Salix, Eichhornia, Salvinia ... Need I go on? The list does not include the Nile Perch, though some of our Queensland cousins tried pretty hard on that score. Often, introduced species have had a clear negative impact and so have tended to attract limnological attention as part of intelligent management procedures.

Perhaps preoccupation with introduced biota and description partly explains another feature which characterises Australian limnology to 1986: a failure to have taken full advantage of certain features of the Australian aquatic environment the study of which has the potential to add substantially to 'global' limnological knowledge. Three environments of this sort spring to mind: salt lakes, temporary or ephemeral waters, and monsoonal flood-drought rivers. H.B.N. Hynes mentioned another in his address to this Society at its last Congress: pristine upland streams (Hynes, 1986). I do not have time to expand this theme. Note, however,, that salt water comprises almost half the volume of all inland waters worldwide (Williams, 1986). Yet we know very little about salt lakes. They are abundant and accessible in Australia. Temporary waters, likewise, have been little studied worldwide. They, too, are abundant and accessible in Australia. As for monsoonal flood-drought rivers, again we are well-endowed, and, unlike other regions where they occur, they can be studied safely here since the Northern Territory and Queensland lack most of the significant human diseases vectored by tropical aquatic insects, and are politically secure. Recall that a very large number of people inhabiting tropical parts of the world depend upon flood-drought rivers for most of their protein requirements. Since we know so little about such rivers our management of them is at a very elementary level (Lowe-McConnell, 1975).

The kindest explanation for our failure to study intensively particular environments of high 'global' interest, and perhaps, even, an explanation near the truth, is that Australian limnologists to date have been spread thinly upon the ground and have had other more pressing engagements. Again, the situation is showing a healthy change, and Australian studies on such environments as streams, large rivers and salt lakes are now and increasingly being quoted in the international literature. Even the North Americans, who almost traditionally tend to quote only work of North American provenance, have lately begun to quote the odd Australian paper or two not published in an American journal!

The uneasy relationship that Australian limnologists have had with the conservation movement, as I mentioned, is yet one more general and characteristic feature of Australian limnology to 1986, if not a formative one. Nobody will deny that inland waters have often occupied centre stage in conservation battles in Australia - I need mention only Lake Pedder (the real one) and the Franklin River in this context -, but professional limnologists as a body have played support not central roles. To be sure, individual limnologists spoke out and sometimes joined the fray, but most Australian limnologists chose to distance themselves somewhat from ardent conservationists. Thus, although the recent High Court battle over the Franklin River was won essentially on legal grounds, it was archaeological not limnological voices which clamoured loudest on the issue.

I suspect that the role played by Australian limnologists in conservation matters generally has been perceived by them as the proper and professional one: certainly, I remember, the Australian Society for Limnology discussed at length at one memorable AGM (aren't they all!) the question of whether it should involve itself in a particular conservation issue. It chose not to do so. But, whatever the propriety or otherwise of the role adopted, it is certainly of interest to note that Australian limnology to 1986 has not generated a strident conservation lobby group, despite the variety and intensity of hazards to Australian inland waters and the accelerating rate of their attrition. I do not want to belabour this point, since I know that many individual Australian limnologists, including me, are deeply concerned about the degradation of inland water on this continent, and I do not want to run the risk of maligning them or unfairly playing down their efforts. but, then again, I think that most of them would probably agree with my general thesis.

On a more positive note, the decision by CSIRO to publish a journal devoted to the aquatic sciences, the Australian Journal of Marine and Freshwater Research, represents another important event in the history of Australian limnology to 1986. Publication began in 1950, a year well before any well-defined group of Australian limnologists existed, and its publication was, with hindsight, a most propitious phenomenon for Australian limnology; the journal served as an early focus for limnological endeavours, its high standard of presentation and refereeing encouraged 'local' publication, and at the same time its wide overseas distribution provided an international outlet for Australian work. I know nothing of the rationale behind the formation of the journal, but probably it involved the need for the Division of Fisheries of CSIRO to have an appropriate 'outlet' for its research. Remember that at that time this Division had an interest in marine, estuarine and fresh water, though its interest in fresh water was short-lived until recent times. Whatever the rationale, from a publication rate of two numbers a year in the 1950's issued 'as material became available', the journal has grown to one regularly publishing six numbers a year. Last year (1985), 66 papers comprising 884 pages were published with a rejection rate of 30%. It is easily the most important journal that has been used by Australian limnologists, and, if I may say so, well-deserves the support it got and has from the limnological community.

A few years ago, Ian Bayly gave this Society a most interesting address (subsequently published: Bayly, 1979) which documented trends in Australian aquatic science since 1950. Most of his analysis was based on an examination of papers published in the Aust. J. Mar. Freshwater Res., and, whilst there is no time to consider his analysis in detail, some important issues may be noted here. First, as reflected by the number of papers published in the Aust. J. Mar. Freshwater Res., there has been a decrease in the relative amount of marine research in Australia, and an increase in limnological research (despite the less generous funding for the latter). Thus, in the period 1950-59, limnological papers comprised some 13 percent of all papers published; in the period 1970-78, they comprised some 50 percent. Secondly, the journal itself showed no growth for about two decades, during which time the number of pages published annually was about 200. Its four-fold growth has only taken place in the last one and half decades. And thirdly, the contribution that CSIRO authors have made has markedly decreased in relation to contribution from authors outside that body (notably in tertiary education institutions).

Also on a more positive note, I pass on now to consider the foundation of the Australian Society for Limnology as another event that has been of considerable general importance in shaping Australian limnology to 1986. I need refer only briefly to the role and history of the Society since I want neither to preempt nor upstage the address to be given later by our President on these matters. But I must record that the Society has played, in my view, a critically formative role in shaping modern Australian limnology; as a bond, a focal point, and a catalyst. From a hesitant start some 25 years ago when it had less than 50 members, it has grown to a professional society with a membership about an order of magnitude greater.

It has also - if I may be allowed to trespass lightly into the realms of present and future Australian limnology - allowed Australian limnology to 'outgrow' it, as it were. Hart (1984) and Walker (1986) have made this point in suggesting that the Society now needs to stabilize its executive, increase its professional approach to matters limnological, and act more pro-actively than reactively. To my mind, these matters could appropriately be considered during the present jubilee congress; now is the time to implement the specific suggestions of Hart. Here, I note only that limnology is a flourishing scientific discipline in Australia, and is making important contributions to science in general and the management of a basic regional resource in short supply in particular. Such a discipline requires more from a Society representing its interests than did a band of young, enthusiastic, wide-eyed limnologists in the early 1960's. Even so, Mr. President, it is abundantly clear that the Australian Society for Limnology can be justly proud of its record, and the strength and enthusiasm of its membership. Its formation was, as I said, of considerable significance in shaping Australian limnology to 1986.

And that, Mr. President, seems an apposite point for me to stop. I wish the Society well for the future, and thank you for listening to me.

ACKNOWLEDGEMENTS

For criticism of a draft manuscript I thank Dr B.T. Hart, Chisholm Institute, Dr Michele Barson, Department of Resources and Energy, and three colleagues at the University of Adelaide, Department of Zoology, Drs M.C. Geddes and K.F. Walker and Mr M.J. Kokkinn. The written account of this review incorporates some minor additions and amendments to the oral version.

REFERENCES

Abbay, R. (1876). Periodicity of the fresh-water lakes of Australia. Nature, Lond. 14: 46:48.

Allen, G.R. (1982). Inland Fishes of Western Australia. Western Australian Museum, Perth.

Anderson, V.G. (1945). Some effects of atmospheric evaporation and transpiration on the composition of natural waters in Australia. J. Proc. Aust. chem. Inst. 12: 40-68, 83-98.

Aston, H.I. (1973. Aquatic Plants of Australia. Melbourne University Press, Melbourne.

Australian Water Resources Council (1976). Review of Australia's Water Resources 1975. AGPS, Canberra.

Barker, J. and Grigg, G. (1977). A Field Guide to Australian Frogs. Rigby, Adelaide.

Bayly, I.A.E. and Williams, W.D. (1973). Inland Waters and their Ecology. Longman, Melbourne.

Bayly, I.A.E. (1979). Aquatic science research in Australia since 1950: an analysis of trends. Aust. Fisheries, 38(12).

Brown, J.A.H. (1983). Australia's Surface Water Resources. Water 2000: Consultants Report No. 1. AGPS, Canberra.

Burns, F.L. and Powling, I.J. (Eds.) (1981). Destratification of Lakes and Reservoirs to Improve Water Quality. AWRC Conference Series, 2.

CSIRO (Compiler) (1970). The Insects of Australia. University of Melbourne Press, Melbourne.

CSIRO (Compiler) (1974). The Insects of Australia. Supplement 1974. University of Melbourne Press, Melbourne.

Cadwallader, P.L. and Backhouse, G.N. (1983). A Guide to the Freshwater Fish of Victoria. Government Printer, Melbourne.

Caldwell, W.H. (1885). On the development of the monotremes and Ceratodus. Proc. R. Soc. NSW 18: 117-122.

Caldwell, W.H. (1887). The embryology of Monotremata and Marsupialia. - Part I. Phil. Trans. Roy. Soc. Lond. 178: 463-486. [Pt. II was never published.]

Calman, W.T. (1896). On the genus Anaspides and its affinities with certain fossil Crustacea. Trans. Roy. soc. Edinb. 38(4): 787-802.

Cann, J. (1978). Tortoises of Australia. Angus and Robertson, London, Sydney.

Child, J. (1968). Australian Pond and Stream Life. Chesnire-Lansdowne, Melbourne.

Chivas, A.R., Torgersen, T. and Bowler, J.M. (eds.) (1986). Palaeoenvironments of Salt Lakes. Palaeogeography, Palaeoclimatology, Palaeoecology. Special Issue. Elsevier, Amsterdam.

Cogger, H.G. (1975). The Reptiles and Amphibians of Australia. Reed, Sydney. [Rev. Edition, 1979]

Cogger, H.G., Cameron, E.E. and Cogger, H.M. (1983). Amphibia and Reptilia. Zoological Catalogue of Australia, 1. AGPS, Canberra.

Collins, D. (1802). An Account of the English Colony in New South Wales, 2: 321-328.

Connell, D.W. (1974). Water Pollution. Causes and Effects in Australia. University of Queensland Press, St. Lucia. [Second Edition, 1981]

Connell, D.W. and Miller, G.J. (1984). Chemistry and Ecotoxicology of Pollution. John Wiley & Sons, New York.

Craig, A.W. and Wilsmore, N.T.M. (1892). Note on an examination of water from L. Corangamite. Aust. Assoc. Adv. Sci. (Hobart) 1892: 270-273.

Darwin, C. (1839). Journal of Researches into the Geology and Natural History of the Various Countries Visited by H.M.S. Beagle, under the Command of Captain FitzRoy R.N., from 1832-36. Colburn, London.

Davies, B.R. and Walker, K.F. (Eds.) (1986). The Ecology of River Systems. Junk, Dordrecht.

Davies, B.R. and Walmsley, R.D. (Eds) (1985). Perspectives in Southern Hemisphere Limnology. Developments in Hydrobiology, 28. Junk, Dordrecht.

De Deckker, P. and Williams, W.D. (Eds) (1986). Limnology in Australia. CSIRO, Melbourne.

Flynn, T.T. (1922). On a fresh-water sponge from Tasmania. Pap. Proc. R. Soc. Tasm. 1922: 58-59.

Fogg, G.E. (1979). Freshwater Biological Association. 1929-1979. The First Fifty Years. FBA, Ambleside.

Francis, G. (1878). Poisonous Australian lake. Nature, Lond. 18: 11-12.

Frith, H.J. (1967). Waterfowl in Australia. Angus and Robertson, Sydney.

Frith, H.J. and Sawer, G. (Eds.) (1974). The Murray Waters. Man, Nature and a River System. Angus and Robertson, Sydney.

Ganf, G.G. (1986). Microscopic aquatic organisms - does small imply simple? Jolly Award Address, 25th Australian Society for Limnology Congress, Lorne, Vic.

Gregory, J.W. (1903). The Geography of Victoria. Whitcombe and Tombs, Melbourne and Sydney.

Gregory, J.W. (1915). The central lakes of Westralia and the Westralian peneplain. Geogrl J. 48: 326-331.

Haigh, C. (Ed.) (1983). Wetlands in New South Wales. National Parks and Wildlife Service, Sydney.

Harris, G.P. (1986). Phytoplankton Ecology. Chapman and Hall, London.

Hart, B.T. (1974). A compilation of Australian water quality criteria. AWRC Tech. Pap. 7.

Hart, B.T. (Ed.) (1982). Water Quality Management. Monitoring Programs and Diffuse Runoff. Water Studies Centre and Australian Society for Limnology, Melbourne.

Hart, B.T. (1984). Water quality management in Australia - future trends. Aust. Soc. Limnol. Newsl. 22(4): 2-12.

Hart, R.C. and Allanson, B.R. (Eds) (1984). Limnological Criteria for Management of Water Quality in the Southern Hemisphere. South African National Scientific Programmes Report, No. 93.

Hills, E.S. (1940). Physiography of Victoria. Whitcombe and Tombs, Melbourne and Sydney.

Holmes, J.W. and Taisma, T. (Eds.) (1981). Land and Stream Salinity. Elsevier, Amsterdam.

Home, E.A. (1802). A description of the anatomy of the Ornithorhynchus paradoxus. Phil. Trans. Roy. Soc. Lond. 92: 67-84.

Huxley, J. (1970). Memories. Allen and Unwin, London.

Hynes, H.B.N. (1986). Some thoughts on the future of running water research with particular reference to Australia. In: P. De Deckker and W.D. Williams (Eds.) Limnology in Australia. CSIRO, Melbourne.

Interim Council (1984). Proposal for an Institute of Freshwater Studies. Report of Interim Council. AGPS, Canberra.

Jack, R.L. (1921). Salt and gypsum resources in South Australia. Bull. geol. Surv. S. Aust. 8.

Jutson, J.T. (1934). The physiography (geomorphology) of Western Australia. Bull. geol. Surv. West. Aust. 95.

Keast, A., Crocker, R.L. and Christian, C.S. (Eds.) (1959). Biogeography and Ecology in Australia. Junk, The Hague.

Keast, A. (Ed.) (1981). Ecological Biogeography of Australia. Junk, The Hague. [Vol. 2]

Kirk, J.O. (1983). Light and Photosynthesis in Aquatic Ecosystems. Cambridge University Press, Cambridge.

Krefft, G. (1870). Description of a giant amphibian allied to genus Lepidosiren, from the Wide-Bay district, Queensland. Proc. Zool. Soc. Lond. 1870: 211-224.

Lake, J.S. (1971). Freshwater Fishes and Rivers of Australia. Nelson, Sydney.

Lake, J.S. (1978). Australian Freshwater Fishes. Nelson, Melbourne.

Lowe-McConnell, R.G. (1975). Fish Communities in Tropical Freshwaters. Longman, London.

Mawson, D. (1929). Some South Australian algal limestones in process of formation. Q. J. geol. Soc. Lond. 85: 613-623.

McCoy, F. (1878). Prodromus of the Zoology of Victoria. Decade II. Government Printer, Melbourne.

McDowall, R.M. (Ed.) (1980). Freshwater Fishes of South-Eastern Australia. Reed, Sydney

Merrick, J.R. and Schmida, G.E. (1984). Australian Freshwater Fishes. Biology and Management. Merrick, Sydney.

Mitchell, T.L. (1838). Three Expeditions into the Interior of Eastern Australia, with descriptions of the recently explored region of Australia Felix, and of the Present Colony of New South Wales. Boone, London.

Mulvaney, D.J. and Calaby, J.H. 1985). 'So Much That is New' Baldwin Spencer, 1860-1929. A Biography. University of Melbourne Press, Melbourne.

Murray, J. (1910). The characteristics of lakes in general, and their distribution over the surface of the globe. In: J. Murray and L. Pullar Bathymetrical Survey of the Scottish Fresh-Water Lochs. Vol. I. Challenger Office: Edinburgh.

Neboiss, A. (1986). Atlas of Tricnoptera of the SW Pacific-Australian Region. Junk, Dordrecht.

Newman, K.E. (1979). Commonwealth Water Policy. Statement in the House of Representatives, 28 March 1979. AGPS, Canberra.

O'Brien, W.T., McGregor, A.M., Crawshaw, B.W. and Kimmerer, M. (1983). Instream and Environmental Uses. Water 2000: Consultants Report No. 9. AGPS, Canberra.

Official Yearbook of the Commonwealth of Australia (1911). Lakes of Australia. Government Printer, Melbourne.

O'Loughlin, E.M. and Cullen, P. (1982). Prediction in Water Quality. Australian Academy of Science, Canberra.

Playfair, G.I. (1914). Contributions to a knowledge of the biology of the Richmond River. Proc. Linn. Soc. NSW. 39: 93-151.

Ruttner, F. (1963). Fundamentals of Limnology. University of Toronto Press, Toronto. [English translation of 3rd Edition by D.G. Frey and F.E.J. Fry].

Sainty, G.R. and Jacobs, S.W.L (1983). Waterplants of New South Wales. Water Resources Commission NSW, Sydney.

Sars, G.O. (1887). On Cyclestneria hislopi (Baird), a new generic type of bivalve Phyllopoda; raised from dried Australian mud. Christiania Videnskabs-Selskabs Fornandlinger, 1: 1-65.

Sars, G.O. (1888). Additional notes on Australian Cladocera, raised from dried mud. Christiania Videnskabs-Selskabs Fornandlinger, 7: 1-74.

Sars, G.O. (1904). On a remarkable new chydroid Saycia orbicularis G.O. Sars from Victoria, South Australia. Arch. Math. Naturv. 26(8): 1-15.

Senate Standing Committee on National Resources (1978). Australia's Water Resources. The Commonwealth's Role. AGPS, Canberra.

Serventy, V. and Raymond, R. (1980). Lakes and Rivers of Australia. Summit Books, Sydney.

Shaw, G. (1799). The duck-billed platypus. The Naturalists' Miscellany, 10.

Smith G.W. (1909). A Naturalist in Tasmania. Clarendon Press, Oxford.

Spencer, W.B. (1893). Contributions to our knowledge of Ceratodus. Part I. - The blood vessels. Macleay Memorial Volume, Linn. Soc. NSW. 1-34.

Spencer, W.B. (Ed.) (1896). Report on the Work of the Horn Scientific Expedition to Central Australia. 4 volumes. Melville, Mullen and Slade, Melbourne.

Thomson, G.M. (1893). Notes on Tasmanian Crustacea, with descriptions of new species. Pap. Proc. R. Soc. Tasm. 1892: 45-76.

Thomson, G.M. (1894). On a freshwater Schizopod from Tasmania. Trans. Linn. Soc. (2), Zool. vi(3): 285-303.

Tillyard, R.J. (1926). Insects of Australia and New Zealand. Angus and Robertson, Sydney.

Trudinger, P.A., Walter, M.R. and Ralph, B.J. (Eds.) (1980). Biogeochemistry of Ancient and Modern Environments. Australian Academy of Science, Canberra.

Tyler, M.J. (1976). Frogs. Collins, Sydney.

Walker, K.F. (1986). The state of ecological research on the River Murray. In: P. De Deckker and W.D. Williams (Eds.) Limnology in Australia. CSIRO, Melbourne.

Warren, J.W. (Ed.) (1978). Symposium on The Murray-Darling River System. Proc. R. Soc. Vict. 90.

Weatherley, A.H. (Ed.) (1967). Australian Inland Waters and their Fauna: Eleven Studies. ANU Press, Canberra.

Weatherley, A.H. (1972). Growth and Ecology of Fish Populations. Academic Press, London.

West, G.S. (1909). The algae of the Yan Yean Reservoir, Victoria: A biological and ecological study. J. Linn. Soc. (Bot). 39: 1-88.

Whitelegge, T. (1889). List of the marine and freshwater invertebrate fauna of Port Jackson and the neighbourhood. Proc. Roy. Soc. NSW. 23: 163-323.

Williams, F.H. (1884). Notes on the platypus. Vict. Nat. 1: 87-89.

Williams, W.D. (1968). Australian Freshwater Life. The Invertebrates of Australian Inland Waters. Sun Books, Melbourne.

Williams, W.D. (Ed.) (1974). Biogeography and Ecology in Tasmania. Junk, The Hague.

Williams, W.D. (1980a). Australian Freshwater Life. The Invertebrates of Australian Inland Waters. Second Edition. Macmillan, Melbourne.

Williams, W.D. (Ed.) (1980b). An Ecological Basis for Water Resource Management. ANU Press, Canberra.

Williams, W.D. (Ed.) (1981). Salt Lakes. Developments in Hydrobiology, 5. Junk, The Hague.

Williams, W.D. (1983). Life in Inland Waters. Blackwell Scientific Publications, Melbourne.

Williams, W.D. (1986). Limnology, the study of inland waters: a comment on perceptions of salt lake studies, past and present. In: P. De Deckker and W.D. Williams (Eds.) Limnology in Australia. CSIRO, Melbourne.

Working Group on Water Research Policy (1981). Water Research in Australia: New Directions. AWRC, Canberra.

Minutes of the ASL Annual General Meeting
held at Lorne, Victoria on 11 May 1986.

In the chair - the President I. Campbell.

1. The meeting began at 4.30 p.m.

2. Apologies were received from: K. Walker, D. Pollard, M. Geddes, P. Harvey, M. Brymner, J. Benzie, J. Bauld, A. Fletcher, F. Michaelis, M. Harvey.

3. Minutes of the previous meeting were accepted on the motion of W. Williams, seconded by P. Suter.

4. FASTS: The executive suggested to the members that the ASL take out full membership so as to enlarge the group of aquatic science socities that have become full members. VIMS, AMSA, Fish Biol., ASPAB have become full members.

   Sam Lake brought up the problem of multiple membership of FASTS by society members who belong to more than one Australian Scientific Society. There seems no simple resolution of this problem.

   D. Mitchell proposed and W.D. Williams seconded the motion that the ASL should become full members of FASTS: passed.

5. The secretary reported that correspondence during the year mostly concerned FASTS and representations to the Minister for Conservation, Forests and Lands in Victoria about logging in the Betka catchment, which has been placed on the Register of the National Estate.

6. President's report: There were 5 meetings of the executive during the year. The ASL book "Limnology in Australia" and the special issue of the AJMFR were both produced during the year. Thanks are due to M. Hart for running the finances of the Society, to R. Marchant for dealing with Minutes and correspondence and to the executive in general.

7. Treasurer's report: the financial statement for 1985/1986 was presented to the members. A $10 profit was made on the Jarrahdale Congress. The Treasurer would like to thank on behalf of the Society:

   Ian McKelvie for printing.
   TAA for airfares and printing.
   Her children for help at various times.

8. Subscription levels: the President outlined to members the need to increase fees to cover membership of FASTS and to provide for increased costs especially printing. He reported that the executive recommended fees be increased to $20 for students; passed.

   FASTS subscriptions will be reviewed at the end of June 1987.

9. Auditor's report: P. Breen proposed that the report prepared by I. Hiscock be accepted; seconded by J. Dean and passed.

10. Newsletter editor's report: M. Barson reported that two issues have been produced since the last conference. The next issue will be coming out soon. The editor thanks W.D. Williams, I. Campbell and R. Tait for material and asks all members to send any material they consider worth-while for inclusion.

11. Bulletin ediotr's report: Sam Lake reported that three papers have been refereed. If one or two more papers are submitted in the next month, then another issue can be produced.

12. Jolly Award: The Jolly award committee (J. Kirk, G. Gant, B. Hart) presented no award this year.

13. Student Award Committee report: C. Yule as chairperson of the committee which also included P. Breen, B. Hart, J. Harris announced that this year's prize was awarded to Peter Davies (Zoology Department, University of W.A.).

14. Student Subsidy Committee report: R. Marchant as chairman reported that four students were given subsidies - J. Hughes, P. Humphries, B. Pusey and P. Hawkins. F. Burns and L. Barmuta were the other members of the committee.

15. The 26th Congress will be held at Albury-Wodonga. T. Hillman spoke briefly about a possible venue.

16. The 27th Congress: Townsville and Canberra were suggested as possible locations. When put to the vote Townsville received 52 votes and Canberra 38. The new executive will treat Townsville as the first option.

17. Election of the Executive: the following were elected unopposed for 1986/87:

President: I. Campbell (Vic.)
Vic-president: T. Hillman (N.S.W.)
Secretary: R. Marchant (Vic.)
Treasurer/Membership Secretary: M. Hart (Vic.)
Executive: R. Shiel (S.A.)
S. Halse (W.A.)
D. Mitchell (N.S.W.)
M. Barson (A.C.T.)
M. McKaige (N.T.)
R. Tait (N.S.W.)
D. Tiller (Vic.)
J. Hughes (Tas.)

18. I. Hiscock was elected Auditor unopposed.

19. General Business

19.1 L. Bennett spoke about funding cuts to CSIRO journals. There is now a 125 page limit for each issue which means a cutback of 200 pages per year for the AJMFR. He asked members to agitate for more funds through FASTS or their Members of Parliament.

I. Bayly who is on the editorial board of AJMFR has written to the Age and the Sydney Morning Herald complaining about this situation.

I. Bayly proposed and S. Lake seconded the motion that the ASL express concern to the Minister of Science about lack of funds for all CSIRO scientific journals. This motion was unanimously carried by the 150 (or so) members of the ASL at the AGM. Letters should be sent urgently to K. Boardman (Chief of CSIRO), G. Evans (Minister for Resources and Energy), ASTEC Committee, AIMS, AMSA and other aquatic societies.

19.2 Fun run: the perpetual trophy was presented to B. Chessman, this year's winner. The run covered 3 km.

19.3 Door prize: Honourable mention was made to P. DeDeckker for losing the door; honourable mention was also made to the three students from the CCAE (Canberra) who wore dinner suits to the annual dinner. However, this year's prize was won by R. Shiel and G. Ganf's Daphnia that was filmed eating plastic balls. The prize is now known as the Memorial Door Prize.

19.4 SIL announcements will be published in the newsletter.

19.5 R. Tait appealed for references on Australian Limnology for inclusion in the newsletter.

19.6 P. Geraghty proposed M. Hart be paid an honorarium of $300; seconded by M. Barson and passed.

The meeting ended at 5.45 p.m.

R. Marchant
Secretary
13.5.86

NEW BOOK - FLOODS OF LAKE EYRE

Lake Eyre, an immense salt lake which drains an area equal to that of France, Spain and Portugal, is without doubt one of the great natural wonders of the world. Not so long ago it was considered to be permanently dry, but the last forty years have witnessed some twenty flood events, with the most spectacular fillings occurring in 1950, 1974 and 1984.

"Floods of Lake Eyre" is an illuminating study of an outstanding natural phenomenon. In a well researched and informative text, author Vincent Kotwicki describes the origin, occurrence and behaviour of water in Lake Eyre and its environment, and gives a first estimate of inflows to the lake in the period 1885-1984. His words are complemented by an excellent series of aerial and satellite photographs, informative maps and graphs, and selection of magnificent colour photographs taken by well-known out-back photographer Bob Mossel.

The book has been published jointly by the Water Resources Branch, Engineering and Water Supply Department of South Australia, and the South Australian Government Printing Division.

The price of the book is $A34.95 plus $7.00 for overseas postage and handling, or $5.00 within Australia.

ECOLOGY INSTITUTE PRIZES 1987
in the field of Terrestrial Ecology
CALL FOR NOMINATIONS

Every year, the Ecology Institute (ECI; Nordbunte 23, D-2124 Oldendorf/Luhe, FRG) selects - in an annually rotating pattern - prize winners among marine, terrestrial or limnetic ecologists. In 1987, prize winners will be selected in the field of terrestrial ecology.

One of ECI's activities is to honor ecologists distinguished by outstanding scientific achievements who are able and willing to provide a critical synthesis and evaluation of their field of expertise, addressing an audience beyond narrow professional borderlines. The winner of the ECOLOGY INSTITUTE PRIZE is requested to author a 200 to 300 printed-page book, to be published by ECI in the series 'Excellence in Ecology' and to be made available world-wide at self cost.

The ECOLOGY INSTITUTE PRIZE is endowed with a stipend of US$5000.

In addition to the ECOLOGY INSTITUTE PRIZE, ECI may set out a second prize honoring a young ecologist who has conducted and published uniquely independent, original and/or challenging research efforts representing an important scientific breakthrough: the IRPE PRIZE (International Recognition of Professional Excellence).

SELECTION PROCEDURE:

Nominations are welcome from all research ecologists. They should reach the Chairperson of the ECI Jury (see below) before June 30, 1987. Eligible are all ecologists engaged in scientific research. The 1986/87 Jury shall select the Prize Winner using the nominations received, as well as their own knowledge of top performers, and their own professional judgement.

ECI TERRESTRIAL ECOLOGY JURY: Chairman, Sir Richard Southwood (Department of Zoology, Oxford University, South Parks Road, Oxford OX1 3PS, England); T.N. Ananthakrishnan, Madras, India; J.L. Harper, Bangor, United Kingdom; E. Kuno, Kyoto, Japan; A. Macfayden, Coleraine, United Kingdom; H. Remmert, Marburg, Federal Republic of Germany; S. Ulfstrand, Uppsala, Sweden.

Further information is available from the editor.

FOURTH INTERNATIONAL SYMPOSIUM CONFERENCE ANNOUNCEMENT ON REGULATED STREAMS (FISORS II)

August 15-19, 1988
University of Technology - Loughborough, England

FISORS II is the fourth in an ongoing series of International Symposia devoted to scientific research on rivers modified by dams and flow diversion schemes. Under the auspices of the Permanent Organising Committee, Symposia have been held in Erie, USA (1979), Oslo, Norway (1982), and Edmonton, Canada (1985).

The objective of this Symposium is to advance the development of environmentally sound management policies and strategies for regulated rivers. One focus will emphasise the need for river management to be based on an historical perspective. Critical reviews of the consequnces of river regulation technologies and strategies will be presented as will papers on assessment methods and modelling. The interactions between channel and floodplain systems and advances in river restoration will be key themes.

SPECIAL TOPICS

River Regulation in Great Britain
Conservation of River Systems
Water Management and River Regulation in Developing Countries
Management of large Alluvial Rivers and their Valleys

ECOLOGICAL CHANGES

Effects of Dams, Weirs and Diversions on Rivers:
Plankton Macro-invertebrates Macrophytes Fish
Wetlands Floodplains Estuaries

* * *

MANAGEMENT PERSPECTIVES

Water-quality of River-reservoir Systems
Fisheries Management
Channel Engineering
Instream Flow Methodologies
River Restoration
River Regulation and Integrated Basin Management

Authors wishing to contribute a paper should submit an abstract (500 words) by 30th November 1987. Selected papers will be published as special issues of Regulated Rivers. Contributed papers for publication must be submitted for review by 15th August 1988.

Local Organiser: Dr G.E. Petts, Department of Geography,
University of Technology,
Loughborough, Leicestershire, LE11 3TU, Uk
Tel: 0509-222791 Telex: 34319 UNITEC G

LIMNOLOGICAL TRIVIA

Why not try yourself on these questions on the bizarre, unusual or record phenomena of limnologica interest in Australia! If you get all ten right you will have a valid excuse for missing Ian Campbell's Presidental Address at the 1987 Albury Conference.

1. Name the deepest lake in Australia and give its depth.

2. Name and give the location of Australia's newest natural lake.

3. Which Australian river becomes less saline as it flows towards the sea?

4. Name the largest stonefly nymph in Australia.

5. Complete the following statement by Gerry Cole (1968) "Perhaps the most remarkable crustaceans of inland hypersaline waters are the Australian _____ _____ _____.

6. Name an Australian fish which incubates its fry in its mouth.

7. Which direction does the Murray River flow at Albury?

8. Estimate the maximum annual sediment and solute yield for an Australian river. Is it ca 0.5, 5, 50, 500 t $km^{-2}y^{-1}$?

9. Which is the roundest lake in Australia?

10. Name Australia's most productive lake.

(now turn to last page to check your result).

LIMNOLOGY BIBLIOGRAPHY

The next installment for the Australian Limnology Bibliography. For inclusion of references, please forward titles, abstracts, reprints or citations to R. TAIT, ESSO AUSTRALIA LTD., P.O. BOX 4047, SYDNEY, N.S.W, 2001. Please keep those letters and cards rolling in.

1985:

BOULTON, A. & SMITH, B.J., A range extension of the snail Glaciuorbis nedleyi Iredale 1943 in Victoria. Vict. Nat. 103: 123-126.

BROCK, B.J., South Australian fouling Bryozoans. In: C. Nielsen & G. Larwood, Bryozoa: Ordovician to Recent. Olsen & Olsen, Fredensborg, Denmark.

LAKE, P.S., DOEG, T. & MORTON, D.W., The macroinvertebrate community of stones in an Australian upland stream. Verh. Internat. Verein. Limnol. 22: 2141-2147.

MITCHELL, D.S. & ORR, P.T., Myriophyllum in Australia. Proceedings 1st International Symposium of Watermilfoil (Myriophyllum Spicatum) and related Haloragaceae Species. pp 27-34.

1986:

BOWLING, L.C. & TYLER P.A., The demise of meromixis in riverine lakes of the World Heritage wilderness of south-west Tasmania. Arch. Hydrobiol 107:53-73.

BOWLING, L.C., STEANE, M.S. (dec'd) & TYLER, P.A., The spectral distribution and attenuation of underwater irradiance in Tasmanian inland waters. Freshwater Biology 16:313-335.

BOWMER, K.H., BOULTON, P.M.D., SHORT, D.L. & HIGGINS, M.L., Glyphosate - sediment interactions and phytotoxicity in turbid water. Pestic. Sci. 17:79-88.

CADWALLADER, P.L. & DOUGLAS, J., Changing food habits of Macquarie Perch, Macquaria australasica Cuvier (Pisces: Percichthyidae), during the initial filling phase of Lake Dartmouth, Victoria. Aust. J. Mar. Freshwater Res. 37: 647-65.

CAMPBELL, I.C., (Ed.) Stream Protection. The Management of Rivers for Instream Uses. Water Studies Centre, Chisholm Institute Of Technology, Melbourne.

HEAD, G. & BALDWIN, J., Energy metabolism and the fate of lactate during recovery from exercise in the Australian freshwater crayfish Cherax destructor. Aust.J. Mar. Freshwater Res. 37: 641-46.

JONES, A.R., WATSON-RUSSELL, C.J. & MURRAY, A., Spatial patterns in the macrobenthic communities of the Hawkesbury Estuary, New South Wales. Aust. J. Mar. Freshwater Res. 37:521-543.

LAKE, P.S. & SOKOL, A., Ecology of the yabby Cherax destructor Clark (Crustacea:Decapoda:Parastacidae) and its potential as a sentinel animal for mercury and lead pollution. AWRC Technical Paper No. 87: pp. 186.

LAKE, P.S., BARMUTA, L.A., BOULTON, A.J., CAMPBELL, I.C. & ST CLAIR, R.M., Australian streams and northern hemisphere stream ecology: comparisons and problems. Proc. Ecol. Soc. Aust 14:61-82.

ROBERTS, J. & GANF, G.G., Annual production of Typha orientalis Presl. in inland Australia. Aust. J. Mar. Freshwater Res. 37: 659-66.

SHIEL, R.J., Zooplankton of the Murray-Darling System. In: B.R. Davies & K.F. Walker: The Ecology of River Systems. Dr. W. Junk, The Netherlands. pp 661-667.

Possible Restructuring of the Australian Society for Limnology Executive Committee - A Discussion Paper.

There has been considerable discussion within the society about the need for the society to become more "professional". More specifically to become more effective in its liason with members, and to increase the profile of the society, and thus of limnology, in the community at large and in political circles in particular. If this is to be done it is essential that the executive should function more effectively than it has in the past. Various suggestions have been made as to the means by which this might be achieved.

At present each executive has only about four meetings during its term, two of those being immediately following one congress and immediately prior to the next. There are usually only two other meetings during the year. Most of the time during the meetings is devoted to organisation of the congresses, since this has been viewed as the major activity of the society. Because the executive is widespread (for example the present executive has members from Melbourne, Adelaide, Perth, Darwin and Albury) a substantial proportion of members are usually unable to attend the two mid-term meetings. Partly as a result the work of running the society is usually left to four or five individuals, thus limiting the amount which can be achieved. Given that all executive members have limited time, and that the society has limited funds (and could not afford to pay travel costs to executive members without increasing subscriptions several fold!), this paper presents several options which could be considered to increase the effectiveness of the executive.

1. Increase the terms of office to allow each executive sufficient time to establish goals and achieve them. The commonly mentioned increase would be from the present one year to two.

2. Increase the size of the executive so that the workload would be shared between more people. This would probably only be effective if the increase was in people geographically close to the President, Secretary etc, because it is difficult for executive members in remote locations to contribute as much. Such an increase would require constitutional changes.

3. Increase the "quality" of the executive. At present the composition of the executive depends to a significant extent on who happens to be present at the AGM, and who happens to get "dobbed". As a result people may find themselves elected to the executive who do not have a high level of commitment to the society, or a feel for the way the society functions. There are several ways in which the "quality" of the executive could be changed. One is by altering the election procedures so that nominations are called prior to the AGM, through the newsletter or at the Congress, this would result in fewer "spur of the moment" nominations. Elections could still be held at the AGM, or, alternatively elections could be held by postal ballot. The first alternative (AGM elections) preserves society tradition and informality, but disenfranchises those unable to attend the meeting.

Some other societies run "tickets" in elections with groups offering to run the society. This would be a possibility although there would seem to be a relatively limited number of institutions with groups large enough to mount such proposals in Australia. The advantage of this method of operation is that it provides a core group from one geographical area or institution which can share the workload.

4. Establishing a separate committee or committees to run annual congresses. This would allow the executive far more time to devote to other activities of the society. The disadvantage could be that the experience of longer standing executive members at organizing congresses would be less available to congress committees.

5. Varying the present practice of electing office bearers and executive members for a single term only. Traditionally the Secretary and Membership Secretary/Treasurer have been the only members of the executive elected for consecutive terms. Only two Presidents have been elected for consecutive terms and usually one or two executive members have been elected for consecutive terms to provide continuity. This has the advantage of providing a high rate of turnover in the executive, thus providing new blood, increasing participation by members and reducing the development of cliques. On the other hand it also reduces the possibilities for pursuing long term development goals for the society.

Recommendations.

1. That terms of office bearers be increased from one to two years.
2. That the size of the executive be increased so that it consists of
   A) President
   B) Vice President
   C) Secretary
   D) Membership Secretary/ Treasurer
   E) Past President
   F) Two elected members from the general membership
   G) Two elected members from each State of Australia (including Northern Territory).
   H) The Newsletter Editor and the Convenors of the next two congresses (by cooption).
3. That one member from each state under category G be elected each year.
4. That the quorum for the executive be eight.
5. That each future congress proposal should include a nominated convenor and a proposed organizing committee.

The intention of this proposal is that it should enlarge the "core" group of executive members available at one geographic location to do the work of running the society, while still ensuring that all states were represented on the executive committee. It would also ensure a

turnover of the committee, because there would be one member from each state elected to the committee each year, while still allowing for continuity. The organization of the congresses would be carried out by the nominated congress committee, and having the two future convenors on the executive at any one time will help to ensure information flow from one convenor and conference committee to the next.

Other issues which should be considered, in view of recent society practice, is whether we should formally commit the society to electing the outgoing vice-president as the incoming president, or whether we should have a president-elect as well as, or in place of a vice-president.

It is intended that these issues should be raised for discussion at the 1987 AGM. If you have views on the matter or any other suggestions, and will not be attending the meeting, I would welcome correspondance which could be either read to the meeting or published in the newsletter or both.

Ian Campbell, President.

COMING EVENTS

1987

8-11 MAY
Australian Society for Limnology 26th Annual Congress, Albury - Wodonga Contact: Mrs M. Hart, 22 Netherby Ave, Mulgrave 3170.

10-12 MAY
Eleventh Symposium on Aquatic Toxicology and Hazard Assessment, Cincinnati. Papers should address, aquatic field toxicity testing of pesticides, fate of chemicals in water and sediments and marine toxicity. Contact: Theresa Smoot, American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA, 19103.

11-15 MAY
Third International Symposium - Toxicity Testing using Microbial Systems, Valencia, Spain. Contact: D. Liu or B.J. Dutka, Toxicity Symposium Committee Co-Chairman, NWRI PO Box 5050 Burlington, Ontario, Canada L7R4A6.

12-16 MAY
Australian Marine Science Association 1987 Conference and 1987 Australian Physical Oceanography Conference, James Cook University, Townsville. Contact: Dr J. Andrews, Secretary 1987 AMSA/APOC Conferences, Australian Institute of Marine Science, PMB No 3, Townsville MC QLD 4810.

17-20 MAY
Symposium on Monitoring, Modelling and Mediating Water Quality, Syracuse, NY. Contact: Dr S.J. Nix, Department of Civil Engineering, Syracuse Univeristy, Syracuse, NY 13210.

22-25 MAY
Ecopolitics II, Centre for Environmental Studies, University of Tasmania. Contact: Tasmanian University Research Company Ltd, GPO Box 252C, Hobart, Tasmania 7001.

25-29 MAY
Biology in Water Management, Academic Committee of the Hungarian Academy of Sciences, Veszprem, Tolbuchin U 37 Hungary. Contact: Secretariate, Budapest VI., Rozsa F.u. 91. H-1064, Hungary.

15-20 JUNE
International Conference on Reservoir Limnology and Water Quality, Ceske Budejovice, Czechoslovakia. Contact: Dr M. Straskraba, Hydrobiological Laboratory, Inst Landscape Ecology, Czeckoslovak Academy of Science, Na Sadkach 7, 370 05 Ceske Budejovice, Czechoslovakia.

24 JULY - 1 AUGUST
XIVth International Botanical Congress, Berlin, FRG. Contact: XIVth International Botanical Congress, Botanisches Museum Berlin-Dahlem, Konigin - Luise - Strasse 6-8, D-1000 Berlin 33, FRG.

3-5 AUGUST
Seventh International Symposium of Astacology, Museum of Zoology, Palais de Rumine, Place de la Riponne 6, PO Box 448 CH-1000 Lausanne 17, Switzerland.*

20-30 AUGUST
XVI Pacific Science Congress, Seoul, Korea. Contact: Professor J.I.F. Urtado, Chairman/Convenor, Freshwater Sciences Committee, C/- Commonwealth Secretariat, Marlborough House, Pall Mall, London SWIY SHX England.

24-28 AUGUST
ANZAAS Congress "Science and Life in the Tropics", Townsville. Contact: ANZAAS Congress Secretariat, James Cook University, Townsville Qld 4811.

1988

FEBRUARY
International Symposium on Predation on Zooplankton by Organisms other than Fish,* Broa, Sao Paulo State, Brazil. Contact: J.G. Tundisi, Limnological Laboratory, CRHEA Department of Hydrology and Sanitation, USP Av Dr Carlos Botelho, 1465 Sao Carlos, SP 13560 Brazil.

10-15 JULY
Conference on water quality and management for recreation and tourism, Brisbane. Contact: R. Sadler, PO Box 388, North Quay QLD 4000.

15-19 AUGUST
Fourth International Symposium on Regulated Streams, University of Technology, Loughborough, England. Contact: Dr G.E. Petts, Department of Geography, University of Technology, Loughborough, Leicestershire, LE11 3TU, UK.

29 AUGUST - 2 SEPTEMBER
First Biennial Water Quality Symposium, Banff Centre, Banff, Alberta, Canada. Contact: B.J. Dutka and D.L. Liu, Co-Chairmen Water Quality Symposia Committee, NWRI CCIW PO Box 5050 Burlington, Ontario, Canada L7R 4A6.

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* Additional information available from editor.

Answers

1. Lake St. Clair, Tasmania. 166.5m
see Derbyshire, E. 1971. The Bathymetry of Lake St. Clair, western central Tasmania. Pap. Proc. Roy. Soc. Tas. 105, 49-57.

2. Lake Elisabeth (alias Landslide Lake) on the east branch of the Barwon River in the Otway Ranges, southern Victoria. It was formed in June, 1952 by a landslide and was 25 m deep at that time. I hear that now it is much shallower due to sedimentation and down-cutting of the dam.

3. The Blackwood river in southwestern West Australia. Many other rivers in the same area probably exhibit this atypical condition also.
see Morissy, N.M. 1974. Reversed Longitudinal Salinity Profile of a Major River in the South-west of Western Australia. Aust. J. Mar. Fresh. Res. 25, 327-35.

4. Nymphs of the genus Thaumatoperla (Fam. Eustheniidae), which are found in eastern Vic. and in NSW, reach ca 50mm. That is big, but of course the greatest is Cathy!

5. "isopods referrable to Haloniscus" see Cole, G.A. 1968. "Desert Biology" (Academic Press: New York) p459. If you want to learn more about this only oniscoid isopod to live in saline waters than start with Williams, W.D. 1983. On the ecology of Haloniscus searli (Isopoda: Oniscoida), an inhabitant of Australian Salt Lakes. Hydrobiologia 105, 137-42.

6. There are at least 3 possible correct answers - Scleropages leichhardti Spotted Barramundi, Hexanematichthys leptaspis Lesser Salmon Catfish, Clossamia aprion Mout Almighty - see Lake, J.S. 1970 Reproductive adaptations in some Australian freshwater fishes (abstract only). Aust. Soc. Limnol. Bull 3, 22-3.

7. West of course, yer mug! You would be surprised at the number of trainee teachers I teach who initially think it flows east to the sea near Bega or Orbost.

8. Nearly 500 t $km^{-2}yr^{-1}$ ---- frightening isn't it! This amount is carried by some streams near Broken Hill (Abrahams, A.D. 1972. Drainage densities and sediment yields in eastern Australia, Aust. Geogr. Stud. 10, 19-41.) and has also been reported following bushfires, eg. 452 t $km^{-2}yr^{-1}$ in the Cann R., Victoria (Chessman, B. 1986. Impact of the 1983 Wildfires on River Water Quality in East Gippsland. Aust. J. Mar. Fresh. Res. 37, 399-420).

9. Lake Mumblin, a crater lake in western Victoria. It has an incredibly low shoreline development of only 1.004 - remember a perfectly round lake has a SD of 1.0. - see Timms, B.V. 1975. Basic Limnology of Two Crater Lakes in Western Victoria. Proc. R. Soc. Vict. 87, 1959-66.

10. Red Rock Tarn near Colac, Victoria. It has an annual primary production of 2201 $gCm^{2}y^{-1}$, which makes it far more productive than any of Tyler's refrigerated pools and second only in the world to L. Mariut in Egypt. See Hammer, U.T. 1981. Primary production in saline lakes. Hydrobiologia 81, 47-57.

Finally, in order to avoid law suits, I declare that the answers given above may or may not be correct and even your decision as judge is not considered final. B.V. Timms

Printed by CHISHOLM INSTITUTE OF TECHNOLOGY PRINTING SERVICES
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